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RECORD OF ORAL HEARING

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MASAYUKI KAMON, and EIICHI YAGI

Appeal 2009-005958
Application 10/689,995
Technology Center 3600

Oral Hearing Held: June 23, 2010

Before JOHN C. KERINS, STEVEN D.A. McCARTHY, and MICHAEL W. O'NEILL, *Administrative Patent Judges.*

APPEARANCES:

ON BEHALF OF THE APPELLANT:

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The above-entitled matter came on for hearing on Wednesday, June 23, 2010, commencing at 9:20 a.m., at the U.S. Patent and Trademark Office, 600 Dulany Street, Alexandria, Virginia, before Paula Lowery, Notary Public.

THE CLERK: Good morning. Calendar Number 69, Appeal No. 2009-005958, Mr. Whitehead.

JUDGE KERINS: Mr. Whitehead, this hearing is open to the public. Are any of the people who entered with you the appellant?

MR. WHITEHEAD: Yes, Mr. Nogeuchi is from the Appellant.

JUDGE KERINS: Mr. Whitehead, we have reviewed the record in the case and are generally familiar with the issues, and we're looking forward to hearing your argument today.

MR. WHITEHEAD: Thank you, good morning. I'm Andy Whitehead, and I represent the Appellant in this Appeal.

For at least the reasons presented in the Appeal Brief and further discussed here today, we request that the Examiner's rejection be reversed. I'd like to begin with, essentially, a short summary of the claimed subject matter and benefits.

JUDGE McCARTHY: Counsel, is there any evidence in the record concerning secondary considerations, such as unexpected results or the like?

MR. WHITEHEAD: Regarding unexpected results in the Appeal Brief, there is discussed the tri-axial intersection point and the benefits associated with that tri-axial intersection.

JUDGE McCARTHY: And is there any evidence or expert opinion concerning the tri-axial intersection point?

MR. WHITEHEAD: There has not been any declaration submitted regarding the tri-axial intersection.

JUDGE McCARTHY: Is there any comparative evidence in the specification that would bear on the results of the tri-axial intersection or any other secondary considerations?

MR. WHITEHEAD: Not directly in the specification itself. The tri-axial intersection point is, essentially, a result of the arrangement of links and joints presented in Claim 8.

JUDGE McCARTHY: Please proceed.

MR. WHITEHEAD: Regarding Claim 8, the sole independent claim pending in the application, it is directed to the articulated manipulator, which is essentially a snake-type robot arm. These types of robot arms are capable of movement essentially by rotating each of the links relative to one another at their respective joints.

The particular articulated manipulator of Claim 8 requires a specified arrangement of links and joints that allow it to function in a manner that provides many benefits over ordinary articulated manipulators.

For example, the articulated manipulator of Claim 8 is capable of operating in a small or confined, narrow or complicated work site. In doing so, Claim 8 requires the first to sixth links arranged in a series, starting from a base. Connecting each of the adjacent joints and the base are a plurality of joints. The joints are one of two types. There are coaxial joints, which rotate around an axis that is coaxial with the links it's connected to. Coaxial joints are shown, for example, in Figure 1 as references D-1 and D-5.

There are also diagonal-type of joints, which are inclined at an angle relative to the axis of the link it is attached to. Diagonal joints are represented as D-2, D-3, D-4 and D-6 in Figure 1.

JUDGE McCARTHY: Counsel, are joints other than coaxial or angled at 45 degrees known in the industry?

MR. WHITEHEAD: Yes. The joints could be of any particular angle. Essentially, though, there are only the two types of joints, being coaxial or diagonal joints. However, there would be essentially any number of angles at which they could be disposed at.

JUDGE McCARTHY: So in other words, we're not talking about just a finite set of linkages that could be coaxial -- could be 45 but nothing else?

MR. WHITEHEAD: Correct. It could be any given angle, especially in the order of the angles could differ. However, each adjacent joint, obviously, has to be at the same angle to the adjacent joint.

JUDGE McCARTHY: Is the use of six linkages -- I believe it's six linkages -- standard in the industry?

MR. WHITEHEAD: Not necessarily. In fact, depending on the length, complexity of movement involved, many combinations of links and joints could exist. Essentially, an infinite number.

You could imagine these robot arms extending for many different links. There's, essentially, no limit.

JUDGE O'NEILL: Wouldn't the number be dependent upon the desired results that the inventor or manufacturer is trying to achieve? Even though it is numerous, wouldn't one of ordinary skill in the art be able to understand how many links they need?

MR. WHITEHEAD: Well, the difference is in the operation. So the more links you have, the more complicated the control becomes of the robot. So there's other aspects when considering the application other than just the number of links. So why a particular range of movement may be desired, one would have to consider more than just the number of joints in doing so. Just to get a particular range of motion, it wouldn't necessarily be well known to just say six joints would be necessary or seven joints would be necessary. There would, essentially, have to be research done to figure out exactly the capability of the arrangement of the links and joints that are put together.

JUDGE O'NEILL: Well, that begs the question what do you feel -- what's your position with the level of ordinary skill in this art? Is it low? Is it high?

MR. WHITEHEAD: Well, I think the level of skill in the art here, we're talking about engineers. We're talking about an educated group of inventors. Now, depending on the complexity of movement that is needed, I think the range of skill in the art varies.

This isn't just a matter of sticking links and joints together and having a robot that works. There's also a lot of computer control and knowledge that goes into figuring out the exact location of where this robot is when it's attempting to be controlled.

So I would say the skill would be relatively high meaning education as engineers.

JUDGE McCARTHY: Is there anything in Takagi which would allow us to get a fix on what the ordinary level of skill in the art is?

MR. WHITEHEAD: I don't think Takagi itself does. The translation we have is very brief, and essentially it more or less shows a particular arrangement of links and joints given its operation. There's not a lot of discussion as to the level of skill presented.

JUDGE O'NEILL: Well, you have said to us that the level of skill is high, and the objective would be well known on where you're trying to reach, why couldn't one of ordinary skill in the art know that these links exist? That hasn't been contested.

Why wouldn't one of ordinary skill in the art be able to arrange them as they see fit in order to achieve the objective result?

MR. WHITEHEAD: It's definitely well known that the links and joints exist. On their face I think the links and joints are simple objects. However, the number of links, number of joints, the angles they're attached at and the relative arrangement of those are what really determine the functionality and complexity of controlling that robot and its associated range of motion.

So although these individual parts may be well known, the arrangement could be taken from an infinite number of possibilities.

JUDGE O'NEILL: Well, you might have a numerous number of possibilities, but what's unpredictable? The objective is predictable, is it not?

MR. WHITEHEAD: Not necessarily, because changing one angle, one joint, or the location of one of the joints, changes the range of motion and the control of that robot itself.

So it's not simply a matter of saying, you know, I need a robot to do this and it's a simple calculation to put these links and joints together to get that.

There is skill involved in knowing which links and joints, and testing these configurations to figure out what will work. What will give you that range of motion? What will reduce the amount of space required to have this robot operate? What will reduce the complexity of control in operating the robot. Those are all considerations that are not just easy to come by.

JUDGE O'NEILL: Well, where in your specification did you go through all of this? The testing that's required to get the movement associated? A review of your specification just basically seems to disclose we have a set of six links with certain diagonal joints, certain coaxial joints, and we've arranged them in this way.

MR. WHITEHEAD: Right, the particular arrangement of the links and joints is described in the specification. In the specification it is discussed that the links and joints do affect the complexity of control.

Right now I'm not able to point to a particular location in the specification that has that on the spot right now.

JUDGE McCARTHY: Counsel, if I understand correctly, the design parameters you're talking about are the complexity of control, things like the position and range of motion you require, presumably the ability to get to the location you're trying to perform a weld or some other function at.

Aren't these all parameters an ordinary engineer would be familiar with?

MR. WHITEHEAD: I think the parameters themselves may be. I think the difficulty comes in in figuring out the arrangements that will operate as intended.

It's not exactly predictable to take any given number of links and joints, any given number of possible angles at which they could be disposed at, and where to place these links and joints.

JUDGE McCARTHY: But couldn't you determine what the ultimate range or path of movement of the end of the structure with a computer model?

MR. WHITEHEAD: I imagine once you had a particular arrangement in mind, you would be able to plug that into a computer model to, you know, essentially figure out what the range of motion would be. But that would be only after coming up with the arrangement itself.

JUDGE KERINS: Along those lines, Counsel, Figure 1 of Takagi appears to have six links.

MR. WHITEHEAD: Correct.

JUDGE KERINS: It appears to only have one joint that differs from what you have in your claims. One of the angled joints, maybe the fourth or fifth link, is angled instead of coaxial. Wouldn't a person of ordinary skill in the art be able to take Figure 1 and comprehend its range of motion, and then say that's not exactly what I want and work from that to maybe change one of the angle joints to a coaxial joint?

MR. WHITEHEAD: I think there has to be some reason or rationale for somebody to do that. Looking at Takagi, you know, from what is shown here the range of motion is not necessarily given in Takagi.

So essentially what somebody would have to do is take Takagi, figure out what its range of motion was, determine that it isn't suitable for what they need, and then determine that some set out of an infinite number of possibilities would give that range of motion they need.

I don't think it would be obvious to come to the specific arrangement of Claim 8 just from looking at this. In Takagi itself, although there's six links shown, as you can see all of the intermediate joints are all angled.

It's not until they've added additional joints to increase the range of motion where they even add any coaxial joints.

JUDGE O'NEILL: Wouldn't a person of ordinary skill in the art say, if I need to extend or change the range of motion of Takagi, I should maybe add some coaxial joints?

MR. WHITEHEAD: I think it's somewhat unpredictable the result that you're going to get in saying, well, what if I swap out this joint for a coaxial joint? What if I swap out this joint for a coaxial joint?

JUDGE O'NEILL: Well, for unpredictability you need to have some sort of evidence that it's unpredictable. Do you have anything in the record here that says that these -- the results are unpredictable? This doesn't appear to be a chemistry case.

MR. WHITEHEAD: Right, it's not a chemistry case, but it is a case dealing with, essentially, in infinite number of possible combinations of links and joints and their positions.

JUDGE O'NEILL: I beg to differ with you on that. I believe the Examiner challenged your position that it's infinite.

That it's finite based on there are a certain number of straight, a certain number of angles, and one of ordinary skill in the art, which does seem reasonable, could not mesh a straight with an angle. So, therefore, there might be a large number, but I think infinite is a mischaracterization.

MR. WHITEHEAD: I think it is close to infinite. You do have coaxial joints which would be 180 degrees --

JUDGE O'NEILL: Well, that's your argument that it's infinite. Have you provided any data to say that it's infinite? Do we have any evidence of that?

MR. WHITEHEAD: I think it's a simple mathematical calculation that there

is 180 degree possibility that these angles could be disposed at, and any number could fall in that range. We're not limited to simply zero degrees, 1 degree, 2 degrees. It could be any within that range.

The particular arrangement of Claim 8 uses 45 degree angles in specified locations relative to one another to produce a particular result. In the art if somebody is just looking -- starting from Takagi or any other robot arm, all you're really given is it's known that links and joints exist.

Simply knowing that links and joints exist does not, you know, provide sufficient data for one to come to a specific arrangement or the unexpected results that we discuss in Claim 8.

JUDGE O'NEILL: Well, you just said unexpected results in Claim 8. What are the unexpected results of Claim 8?

MR. WHITEHEAD: The unexpected results being the tri-axial intersection point which is the specific combination of the links and joints that creates the point among the coaxial joint of the fourth and fifth links, the diagonal joint between fifth and six link, and the terminal portion of the sixth link. Essentially, it would be an intersecting line from each of those positions to come up with the point.

What this allows is an ease of control of the robot arm being that you'd have to track that point as opposed to doing the inverse conversion from each rotation of the joints to figure out where the terminal portion is in space.

JUDGE O'NEILL; But the claim is just directed to a manipulator. I don't see anything about computer control or the tri-axial intersection point. Maybe we've overlooked something in your specification that is directed to this point and the control system associated in order to develop an arm to get to this point.

What I'm seeing in your claim is a basic set of links and set of joints.
MR. WHITEHEAD: Right, the structure is what is claimed in Claim 8. A specified arrangement of links and joints and their orientations.
JUDGE O'NEILL: I guess that goes back to the ultimate question. Why is the arrangement -- why is the arrangement, while the Examiner has acknowledged that it's different, why does the difference carry you to the realm of nonobviousness?
MR. WHITEHEAD: I think the Examiner's broad allegation that because links and joints are known, that any combination of links and joints in a robot arm is obvious is simply too broad and incorrect.
JUDGE O'NEILL: Well, that's what the Examiner said in the actual ground of rejection, but in responding to your argument the Examiner said that -- he came up with a rationale that a person of ordinary skill in the art would in designing a robot for a particular purpose arrange the links in such a way that the desired end result is achieved.
So how do you respond to that point?
MR. WHITEHEAD: I think what's required is some reason or rationale to come to this specified arrangement of links and joints that's being claimed. Specifically, six links, coaxial joint between the base and first link, another coaxial joint between the fourth and fifth link, and specified 45 degree angle for all of the other joints.
There's nothing in Takagi that would say we need to improve or change the relative motion and range of motion of the robot arm to insert these coaxial joints at the base and first link between the fourth and fifth link and maintain 45 degrees between the others at these altering angles.

From our perspective in Takagi it appears they recommend adding joints, especially if you're going to add another coaxial joint. The Figure 5 is the only reference given that shows the addition of an additional coaxial joint, but in doing so, they also have added several additional links.
So there's no reason or rationale presented that would lead one of ordinary skill in the art to come to the particular arrangement of Claim 8.
JUDGE McCARTHY: Counsel, if I understand correctly, going to I believe it's Figure 1 of Takagi, doesn't the first three linkages there line up with the first three linkages recited in the claim?
MR. WHITEHEAD: Well --
JUDGE McCARTHY: So, in fact, we're talking about a change in merely the last three degrees of freedom of the device?
MR. WHITEHEAD: Well, there'd be the addition of the second coaxial joint between the fourth and fifth link, which is not shown in Takagi.
JUDGE McCARTHY: But we're talking about a change in one degree of freedom, which would then affect the next two degrees of freedom as well.
MR. WHITEHEAD: Any change in the angle or position of these joints would change the operation of the Takagi device. It would also require, obviously, new controls and new sets of mathematical equations to determine the location of the terminal point.
JUDGE McCARTHY: But, once again, those equations would be derivable by one of ordinary skill in the art. One of ordinary skill in the art could predict how this change would affect the range of motion.
MR. WHITEHEAD: I don't necessarily think that they could predict how it

would change without testing. So I think it would be an inordinate amount of testing to try to swap out different joints at different positions, do all the testing that would be required to determine --

JUDGE McCARTHY: Is there anything in the record that would indicate what sort of testing would be required?

MR. WHITEHEAD: Not that I'm aware of, Your Honor.

JUDGE KERINS: We're nearly out of time. If you have any concluding remarks --

MR. WHITEHEAD: So, essentially, what we'd like to say is there is no reason or rationale presented in Takagi or elsewhere that would lead one of ordinary skill to come to this particular arrangement of links and joints. In addition, the modification of Takagi would have led to a change in its capabilities and complexity of its robot arm, and altering of combinations of Takagi would have required a completely new principle of operation to be derived to calculate its range of motion, which would be different from the Japiskse case the Examiner has cited which involves the mere movement of a switch which didn't change any of the operation of its device. Changing any of the angles, joints, links in Takagi, it would change the operation of its device.

So for at least these reasons, we don't believe that Claim 8 would have been obvious over Takagi, and we ask the Board to reverse the rejection.

JUDGE KERINS: Any further questions, Judge McCarthy?

JUDGE McCARTHY: Is there anything in the record that would indicate that your device of Claim 18 is intended for a different purpose than the device of Figure 1 of Takagi?

MR. WHITEHEAD: The intent of the device of the present claim discloses it is intended for use in narrow, complicated work areas, which isn't necessarily the scope of Takagi.

JUDGE McCARTHY: And it's your contention that working in narrow areas is something that would not be predictable, or something that would not be looked for by one of ordinary skill?

MR. WHITEHEAD: It would solely depend on the purpose of the device. If it was to be used in an open manufacturing environment, no. I think the range of motion and narrow work spaces, things of that nature would not be something they would consider.

JUDGE McCARTHY: Thank you.

JUDGE KERINS: Judge O'Neill?

JUDGE O'NEILL: No.

JUDGE KERINS: Thank you very much, Mr. Whitehead. We'll take the case under advisement.

MR. WHITEHEAD: Thank you.

Whereupon, the proceedings at 9:50 a.m. were concluded.